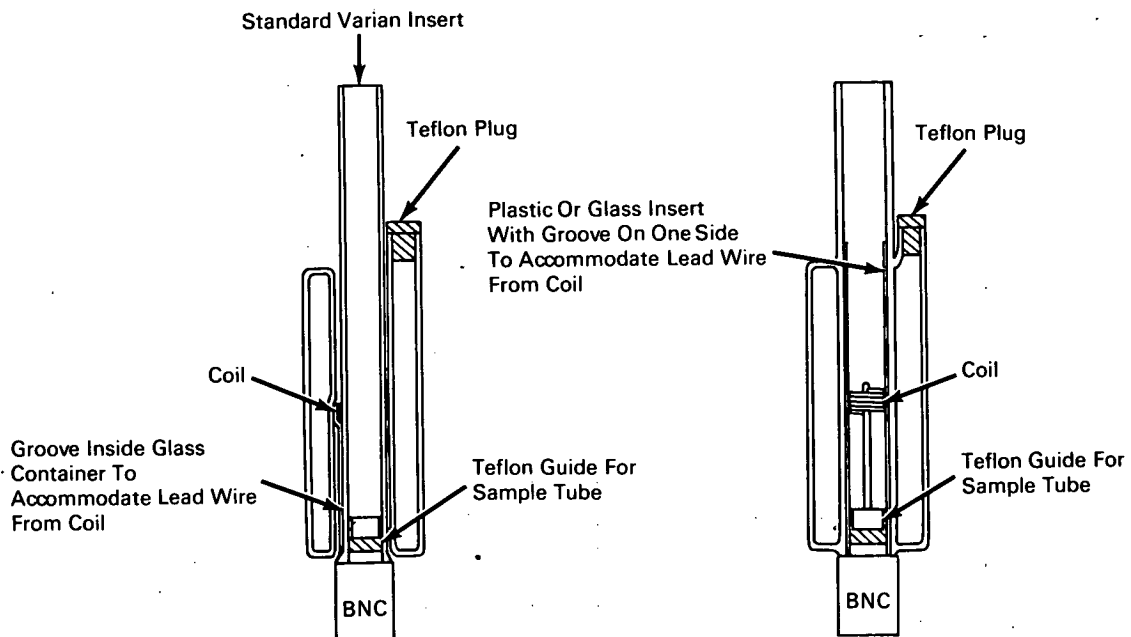


# NASA TECH BRIEF



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## An Improved Nuclear Magnetic Resonance Spectrometer



### The problem:

To accomplish a high degree of nuclear stabilization of a nuclear magnetic resonance (nmr) spectrometer for low gyromagnetic ratio nuclei in a simple, straightforward manner. Such stabilization has previously been possible only through a complicated nmr system employing frequency synthesis.

### The solution:

A device in which a sample of a reference substance is placed in a container that is slipped over presently used nmr receiver inserts. The transmitter excites the nuclei in this container external to the coil windings and the nuclei induce a signal in the signal coil of

opposite phase to that of nuclei in a sample container inside the receiver coil winding.

### How it's done:

A cylindrical sample container is placed coaxially about the common nmr insert as shown in the left figure. A reference sample in such a container has a sufficiently homogeneous field to give a signal suitable for locking the field and frequency of an nmr spectrometer with a simple audio modulation system of a type widely in use. Spectra of  $N^{14}$ ,  $C^{13}$ ,  $B^{11}$ ,  $P^{31}$ ,  $F^{19}$ , and  $H^1$  are successfully recorded when the spectrometer is stabilized on a sample of the corresponding nucleus in such a sample container external to the

(continued overleaf)

receiver coil. Resolution of the order of 0.2 to 0.4 cps is achieved for N<sup>14</sup>, C<sup>13</sup>, B<sup>11</sup>, and P<sup>31</sup>.

**Notes:**

1. The ultimate in design to increase the field homogeneity at the sample and reference would be a one-piece insert with the receiver coil wound inside as shown in the right figure. The problems concerning such a design are under study, the winding and placement of the coil being the greatest at present.

2. Inquiries concerning this innovation may be directed to:

Technology Utilization Officer  
NASA Pasadena Office  
4800 Oak Grove Drive  
Pasadena, California 91103  
Reference: B67-10234

**Patent status:**

No patent action is contemplated by NASA.

Source: Stanley L. Manatt and Daniel D. Elleman  
(JPL-762)